Abstract

Walking comes naturally to us and appears to be simple. However, this is not so and it is known that walking requires high level neural control and muscle coordination. There is no single, unifying theory of bipedal walking. Models of walking are useful in various ways such as developing computational theories of neural control, understanding muscle coordination and to design and analyze lower extremity prostheses. This thesis deals with modeling and simulation of walking from a kinematics and dynamics view point. Three sagittal planar models with increasing levels of complexity are presented in this thesis. The first model is a simple two degrees of freedom (DoF) model representing the motion at the hip and the knee joint. The second model is a three DoF model where the ankle joint motion is also taken into account. Finally, the third model considers both the legs and has seven DoF. The kinematic and dynamic equations of the models are derived, and the inverse dynamic analysis and forward dynamic simulation of the models are performed. The simulation results are compared with experimental data available in literature.